organs in the appendages of the body are like those over the sense organs of Lumbricus. Over the body itself each cuticular marking is concave on the exterior and the very thick cuticula encloses beneath each marking an ovoid cavity through which pass the outer ends of the sensory cells. Each sensory cell usually bears several sensory hairs, and these hairs cannot be retracted normally as supposed by Retzius.

In the gill lobes of the parapodia, the base of the palps, the prostomium and several anterior metameres is found a second kind of sense organ, apparently a light-perceiving organ, not previously described.

In the center of each organ is a slender, flexible tube, open to the exterior and continuous with the cuticula. Around this tube the club-shaped peripheral ends of 100 or more bi- or multipolar nerve cells are arranged in a spiral of from 8 to 14 turns. The bodies of these cells are irregularly grouped in or beneath the base of the epidermis; the central nerve fibre passes to the central nervous system; the peripheral fibre is at first slender, but ends in the club-shaped enlargement mentioned above. The tip of this enlargement, and sometimes the entire enlargement itself, is filled with a clear, highly refractive, lens-like substance.

The central fibres from both diffuse and light-perceiving organs end in *apparent* nerve baskets around the ganglion cells of the central nervous system.

Beside the four eyes and the two pairs of sense organs of unknown function described by Retzius, the prostomium contains a third pair of organs near the anterior pair of Retzius. The groups of ganglion cells described by Retzius near the anterior eyes are not, as that author supposed probable, concerned with the innervation of the eyes; the preparations from which this study was made show plainly the nerve bundles passing from the eyes to the brain.

Epidermal Sense Organs in Certain Polychætes. Margaret Lewis.

The epidermal sense organs were studied in two members of the annelid family of the Maldaniæ, both by means of ordinary methods and by the use of methylin blue. The following are the chief conclusions:

1. That multicellular sense organs are present throughout the integument of the two polychæte annelids *Clymenella torquata* and *Clymene longa*.

2. That the cells of these sense organs are spindle-shaped, bipolar nerve cells.

3. That the individual cells making up a sense organ show great variation in the distance of the enlargement containing the nucleus from the cuticula. This enlargement may be close to the cuticula, at half the height of the epidermis or sunk to the base of the epidermis.

4. That the cells of the sense organs possess at their peripheral ends sensory hairs.

5. That from the deep end of each cell proceeds one process which turns at an angle beneath the epidermis toward the central nervous system.

6. That in many respects the sensory cells of these epidermal sense organs show a striking resemblance to the epidermal sense cells which Retzius describes for *Nereis;* the chief difference being that Retzius found only isolated sense cells in the epidermis of *Nereis*, whereas in these Maldanids these sense cells without exception are grouped into definite sense organs.

The Eyes of Limax maximus. A. P. Henchman.

The eye consists of six parts: (1) Optic ganglion, (2) Sclerotic capsule, (3) Retina, (4) Vitreous humor, (5) Lens, and (6) Corneal layer. The optic ganglion is a funnel-shaped enlargement of the optic nerve, containing oval nuclei. The sclerotic capsule is a thin, firm layer of connective tissue, containing at intervals oval

nuclei which are much flattened. The retina is composed of nerve fibres and a single cell layer embracing two kinds of cells: viz. (*a*) pigment cells and (*b*) sensory cells. In sections along the chief axis of the eye the retina presents three concentric zones; the innermost, of a pale yellowish color, is composed of the so-called cones; the middle is the pigment zone and exhibits higher radial bands alternating with broader masses of more opaque appearance; the outer zone, which is destitute of pigment contains, nuclei of two kinds: large, pale, circular ones, and smaller, elongated, deeply staining ones. The branches of the optic nerve constitute the outermost portion of this clear zone next to the sclerotic.

These three zones are really made up of a single layer of cells, the retinal cells, of which there are two kinds: the unpigmented, or sensory, and the pigmented. The pigment cells are club-shaped and contain granules of dark brown pigment. Their central ends all terminate at nearly the same level and rather abruptly. Their basal ends run out into long fibres which are often branched. The lighter radial bands of the middle zone are produced by the sensory cells. These extend nearer to the center of the eye than the pigment cells, each ending in a club-shaped portion that is rounded at its free extremity. This club-shaped prolongation is surrounded by a thick mantle of substance having a radially fibrous structure. These prolongations with their mantles constitute the 'cones.' The unpigmented, or sensory, cell itself shows throughout its whole course a longitudinally fibrous structure, contains no pigment and terminates at its deep end in a large number of fibrous branches.

The sensory and pigment cells are definitely grouped into sets. Each set, or ommatidium, comprises a single central sensory cell and a small number (5–7) of pigment cells surrounding it.

In front of the pigment cells of the antero-ventral margin of the chief eye its sclerotic capsule is somewhat enlarged so as to include a hitherto undescribed structure, which reproduces on a smaller scale almost exactly the conditions found in the chief eye. In one respect only does it differ from the chief eye; the cells corresponding to the pigment cells of the retina *contain no pigment granules*. In other respects it presents the same histological conditions and a similar arrangement of the histological elements. The innervation of this accessory retina is effected by nerve fibres from the optic nerve, which accompany those distributed to the antero-ventral portion of the chief eye. The cells composing the accessory eye are separated from the pigment cells of the adjacent parts of the chief eye by elongated cells with small oval nuclei. At the angle formed by the juxtaposition of the two retinas are seen several very large nuclei. Some of these are probably the nuclei of sensory cells, but there are others which are much larger than the nuclei of the sensory cells and do not seem to be connected with cells terminating in fibrous cones; they have a striking resemblance to the large ganglionic cells of the central nervous system. These are the largest nuclei found within the eye capsule.

The Optic Lobes of the Bee's Brain. F. C. KENYON.

In the optic lobes of the bee's brain there are, as in other hexapods, three masses of fibrillar substance surrounded more or less completely by masses of cells. The middle and inner masses or bodies may in section be recognized as composed of a pair of lenticular, densely and finely fibrillar bodies or capsules, fitted one within the other and with their convex surfaces directed outward, their concave surfaces inward. The capsules in each body are separated from one